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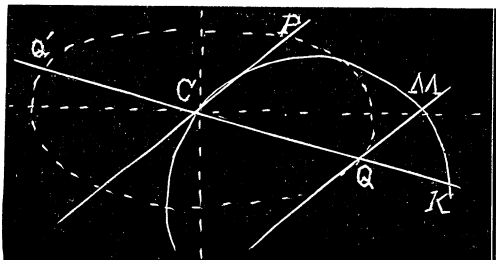
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Proof. MN is tangent to the conic.

Now it can be easily shown that if a tangent meets any two lines in such a way that the product of its segments equals the square on the parallel semi-diameter, then the two lines are parallel to a pair of conjugate

diameters. In the above construction, $NQ \cdot QM = CQ \cdot QK = CP^2$.

Therefore, CM and CN are the axes (since they are at right angles). Now let r = side of a square whose area is four times the triangle QCP ; then $r^2 = 2ab$. Let s = hypotenuse of a right triangle whose legs are CP and CQ ; then $s^2 = CP^2 + CQ^2 = a^2 + b^2$. Now construct $m = \sqrt{(s^2 + r^2)}$ and $n = \sqrt{(s^2 - r^2)}$; then $m = a + b$, $n = a - b$; hence, $a = \frac{m+n}{2}$, $b = \frac{m-n}{2}$.

II. Solution by H. C. FEEMSTER, York College, York, Nebraska.

Let $a'a$ and $b'b$ be the conjugate diameters, making the angle aOb . Through a draw a parallel to Ob , this will be a tangent to the ellipse. Extend Oa to P , so that Ob is a mean proportional between Oa and OP . Draw a perpendicular bisector of Op intersecting the tangent through a at C . With C as a center draw a circle through P and O , cutting aC in A and B . Draw OA and OB ; these will be the semi-axes of the ellipse, for $Aa \times aB = Oa \times aP = Ob^2$. OA and OB are conjugate diameters, and are perpendicular to each other. And these make the required angles with the given diameters. See Salmon's *Conic Sections*, pages 172 and 173.

Also solved by C. N. Schmall.

CALCULUS.

325. Proposed by E. B. ESCOTT, Ann Arbor, Michigan.

$$\text{Integrate } \int \frac{4x^6 - a^3}{\sqrt{(x^6 - a^3)}} dx.$$

Solution by MARY E. WILSON, Olivet College, Olivet, Michigan.

$$\begin{aligned} \text{Let } x^2 = z. \quad \text{Then } dx = \frac{1}{2} \frac{dz}{\sqrt{z}}. \quad \text{Hence, } \int \frac{4x^6 - a^3}{\sqrt{(x^6 - a^3)}} &= \int \frac{4z^3 - a^3}{2\sqrt{(z^4 - za^3)}} dz \\ &= \sqrt{(z^4 - a^3z)} + C = x\sqrt{(x^6 - a^3)} + C. \end{aligned}$$

Also solved by G. W. Hartwell, and the Proposer. The Proposer multiplied both numerator and denominator by x , after which the integral is seen directly.